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(54) Vending machine for audio-visual and digital media and associated identification tag.

(57) An automatic device for distributing audiovisual and digital media includes a magazine (M) adapted to contain the media (S), at least one handling unit (T) for loading and externally unloading the media through a slot (6), a device for reading an identification tag associated with each medium (S), a device for the selection of a medium on the part of a user, and a device (7) for the automatic payment of the preselected medium. The magazine (M) is formed by separate sections (M_1, M_2, M_3) for corresponding media (S_1, S_2, S_3) which have different formats and sizes. The handling unit (T) includes a carriage (8) which can move along a first vertical guide member (10, 11), a slider (15, 16) which can move along a second horizontal guide member (14) rigidly associated with the carriage and is provided with a clamp member (21) for handling the media. The clamp member includes movable jaws (20, 21, 22) and a device (28, 29) for automatically varying the mutual distance of the jaws (20, 21, 22) along a fourth guide member.

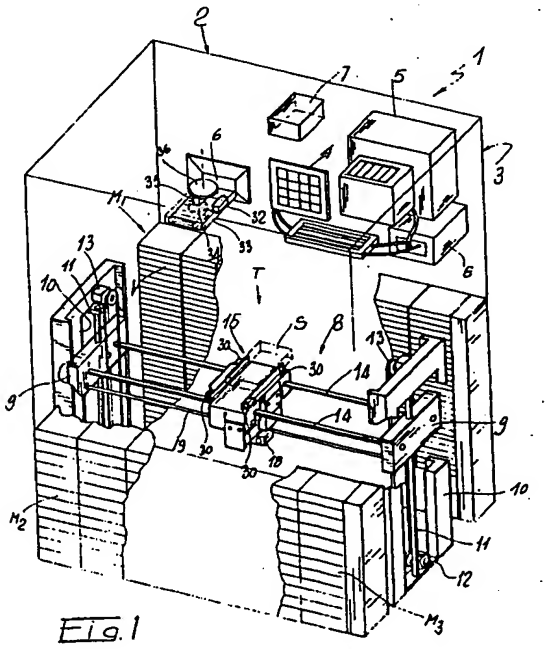

Fig. 1

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The present invention relates to a device for the automatic distribution of products such as audiovisual and digital media and to a media identification tag which can be used with the device.

The device according to the invention can also be used to distribute products for various consumption, such as drugs, cigarettes, food products, batteries, etc., so long as they are enclosed in packages substantially shaped like a parallelepiped.

As is known, modern vending machines require, for verification or checkout, the insertion in appropriate slots of tokens, coins, bank notes or magnetic identification cards issued beforehand by the owner to the customer when a contract is drawn up. These cards are inserted in an appropriate reader located on the vending machine, authorizing the checkout and return of videocassettes, by means of the clearance signal of a computer which analyzes the customer data read from the magnetic card, comparing them with the data it stores.

Vending machines of the latest generation are usually composed of box-like containers internally provided with at least one loading/unloading magazine for accommodating the videocassettes; the magazine cannot be accessed from outside except by authorized personnel. The container contains at least one handling unit which moves the videocassettes, a magnetic card reader which has an opening onto the outside, and an optical reader located downstream of the videocassette entry/exit slot for identifying bar codes applied to the sides of the videocassettes. There is also a means for communicating with the outside, which consists for example of a monitor, of a keyboard, of an entry/exit slot, which can be accessed from outside in order to allow the customer to make his selections. A central processing unit actuates and controls the various loading/unloading operations after identifying the customer and the videocassette to be handled.

Handling units essentially consist of clamp devices with movable jaws which are actuated by electric or magnetic actuators so that they lock against the sides of the cassette. The videocassettes gripped by the clamps are moved on sliders or conveyor belts to position them on the handling units, which convey and deposit the selected videocassette outside the machine, or do the reverse if the videocassette is being returned.

Known handling units are generally constructively rather complicated and are therefore subject to a high fault rate. If they are provided with clamps with magnetic locking devices, these devices can demagnetize the videocassettes.

A limitation of known vending machines consists of their scarce flexibility, since they are designed exclusively for the distribution of a single type of videocassette, and both the related handling units and the internal magazines do not provide for the handling and containment of other audiovisual or digital media of different dimensions and types.

A further drawback consists in the difficulty of placing identification labels on media having a limited height, such as for example so-called compact discs.

The aim of the following invention is to eliminate the drawbacks described above by providing a vending machine for products substantially shaped like a parallelepiped, in particular for audiovisual and digital media, which is capable of handling media of different formats and sizes stored simultaneously inside the device.

An object is to provide a vending machine which allows to recognize, in a highly reliable manner, identification tags arranged even on media which have a cylindrical symmetry and a limited thickness and are arranged within containers shaped substantially like a parallelepiped.

Another object is to provide a vending machine which allows to simultaneously perform the operations for checking out and returning audiovisual and/or digital media on the part of multiple users, increasing the productivity of the apparatus.

This aim, these objects and others which will become apparent hereinafter are achieved by an automatic device for distributing products externally shaped substantially like a parallelepiped, in particular audiovisual and digital media, which includes a magazine which cannot be accessed from outside and is adapted to contain products, at least one handling unit for loading and externally unloading the media through a slot, a means for reading an identification tag associated with each product, a means for the selection of a product on the part of a user, and a means for automatic payment for each preselected product, characterized in that the magazine is suitable to contain products of various formats and dimensions, the handling unit being suitable to recognize and handle the products independently of their dimensions and types.

According to a further aspect of the invention, a tag is provided for the identification of an audiovisual and digital medium which has a cylindrical symmetry, is substantially flat, has a limited thickness and is arranged within a container shaped substantially like a parallelepiped; the identification tag can be used in combination with an above described automatic device, and is characterized in that it has a data plate with a plurality of radial bars which are centered on the axis of symmetry of the medium and are at right angles to its main surface. Preferably, the data plate with the bars is annular

and has a radial width equal to the maximum positioning error of the medium on the loading/unloading means.

With a device and an identification tag according to the invention, one obtains the advantage of distributing with a single apparatus products of various kinds and dimensions, and in particular videocassettes, compact discs, videogames, videodiscs and other audiovisual and digital media which currently exist or are soon to be produced.

Further characteristics and advantages will become apparent from the detailed description of a preferred embodiment of a vending machine for products such as audiovisual and digital media according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a partially sectional general perspective view of a vending machine according to the invention;

Figure 2 is a side view of the vending machine of Figure 1, shown in cross-section along a vertical plane indicated by II-II;

Figure 3 is a front view of the vending machine of Figure 1, shown in cross-section along a vertical plane indicated by III-III;

Figure 4 is a perspective view of a detail of the vending machine of Figure 1;

Figure 5 is a partially sectional bottom view of the detail of Figure 4;

Figure 6 is a front view of the detail of Figure 4, shown in partial cross-section along a vertical plane indicated by VI-VI;

Figure 7 is a side view of the detail of Figure 4, shown in partial cross-section along a vertical plane indicated by VII-VII;

Figure 8 is a view of an example of a tag for the identification of media having cylindrical symmetry which can be used with the vending machine according to the invention.

With reference to the above figures, a vending machine for products substantially shaped like a parallelepiped, for example audiovisual and digital media, according to the invention, generally designated by the reference numeral 1, includes a substantially closed container 2 which is approximately shaped like a parallelepiped and is formed by a metallic structure covered with front, lateral and top panels, so as to form a larger front face 3. The container 2 contains a magazine M for audiovisual and digital media S, at least one handling unit T for handling the media S, and a central processing unit E for controlling the handling unit T and the operating functions of the device.

There is also a means for interfacing with the user, which consists of at least one alphanumeric keyboard 4, of a monitor 5, of at least one slot 6 for the entry/exit of the media, and of at least one slot 7 for magnetic custom identification cards.

A particular characteristic of the invention consists of the fact that the magazine M is suitable to contain audiovisual and digital media S_1, S_2, S_3 ... of various kinds and dimensions, and is provided with a means for recognizing and handling each one of the media independently of their dimensions and types.

In particular, the magazine M can be divided into sections M_1, M_2, M_3, ... meant to accommodate the corresponding media S_1, S_2, S_3, ... of different types and dimensions. For example, it is possible to store videocassettes in the VHS standard, audio cassettes, compact discs, videodiscs, videogames in various formats, but also drugs, cigarettes, food products, confectionery products, batteries, contained in box-like packages externally shaped substantially like a parallelepiped.

The different sections may be arranged both frontally and on the rear of the vending machine in mutually adjacent or facing positions in order to utilize the available space as much as possible. As an alternative, some sections may also be arranged on the sides of the container 2.

Obviously, each individual magazine section is constituted by a set of compartments or cells V which are substantially prism-shaped and are suitable to accommodate the corresponding media with a certain play.

The handling device T can move in a controlled manner along three mutually perpendicular directions in a space comprised between the magazines and the entry/exit slot 6.

In particular, the handling unit is advantageously constituted of a moving carriage 8 formed by a pair of plates 9 which can slide along first vertical guides, constituted by lateral metallic profiled members 10 and vertical rods 11, which are anchored to the structure of the container 2. A carriage movement means is provided and comprises gearmotors 12 coupled to an appropriate actuation means 13, for example of the type with a chain closed in a loop or of the screw-and-nut type.

A pair of substantially horizontal and mutually parallel sliding rods 14 is rigidly coupled to the two plates; the rods form a second guiding means for a slider which is generally designated by the reference numeral 15.

The slider 15 has a main body 16 with a transverse cross-section shaped substantially like an inverted U, which includes ballscrew bushes 17 for sliding along the rods 14 of the carriage and an electric micromotor 18 which engages on a belt 19 the ends of which are fixed to the plates 9, for the movement of the slider parallel to the rods 14.

A clamp means is mounted on the slider 15 to grip the media and comprises a pair of profiled members 20 which are elastically connected to

rigid jaws 21 by means of flat springs 22. The jaws 21 are mounted on a clamp body 23 which is slidingly mounted on a pair of bars 24 which are at right angles to the rods 14 and form a third guiding means. A micromotor 25 is associated with the clamp body 23 and cooperates with a toothed belt 26 the ends of which are anchored to the slider body 16 for movement along the bars 24.

In order to move the jaws 21 mutually closer and further apart, so as to grip and release the media S adapting to their corresponding widths in a transverse direction, the jaws can move parallel to the rods 14, since they are mounted on a pair of profiled members 27 which form a fourth guiding means and are respectively coupled to the complementarily threaded ends of an actuation bar 28 which is connected to a micromotor 29.

Proximate to the longitudinal ends of the grip profiled members 20 there are optical sensors 30 for detecting the relative position of the handled media. The sensors send signals to the computer, which actuates the clamp body for the number of times required for the perfect positioning of the media on top of the body 16 of the slider 15.

In general, stroke limiting microswitches, not shown in the drawings, are associated with the various guiding means and are suitable to report to the computer the exact position of the handling unit and to consequently coordinate the various movements thereof in the space inside the vending machine.

Both the slider and the clamp body can be made of plastic materials in order to reduce the weight and inertia of the moving parts. All the moving parts are furthermore provided with bearings of various kinds; furthermore, the guides are preferably constituted by round metal bars manufactured with a high degree of surface finish in order to minimize friction.

A map of the media inside the magazine is stored in the computer E and is updated automatically at each operation, as described hereinafter. Each medium S is provided with a label 31 on which a bar code is provided; in the case of prism-shaped media having a sufficient height, the label is applied to one of the sides. Recognition of each code is performed by means of an optical reader 32 which is fixed just inside the media entry/exit slot 6 above a conveyor belt 33 so as to perform the reading operation during translatory motion.

If the products are constituted by media which have cylindrical symmetry, such as compact discs, and in any case have a limited thickness and are placed within cassettes which are substantially shaped like a parallelepiped, it is not possible to apply bar codes to one of the sides of the medium, and therefore it is necessary to apply the label on the upper or lower main face thereof. However, this arrangement would pose considerable problems in identifying the direction of the label and would therefore be difficult to execute.

According to the invention, there is a media identification tag 34 with a plurality of radial bars centered on the axis of the medium which is at right angles to the main faces of the medium. As clearly shown in Figure 8, the radial bars are produced on an annular data plate the radial width of which is equal to the maximum positioning error of the medium on the conveyor belt 33.

Correspondingly there is a second optical reader 35 which is arranged above the belt 33 and is anchored to a platform 36 which can rotate about a vertical rotation axis 37. The axis 37 is aligned with the centerline of the conveyor belt 33 and is arranged at a preset distance from the slot 6, at a position in which the medium S is temporarily stopped prior to its inward or outward translatory motion.

By means of this media recognition system and by virtue of the versatility of the handling unit, the aim of using a single vending machine for audiovisual and digital media, independently of their different types and dimensions, is achieved.

Identification of the user and the possible charge related to the rental and/or sale of media is performed automatically and in a per se known manner by means of a magnetic card which contains the customer information, is provided to the customer at a prior time and can be inserted in an appropriately provided slot 7 which is associated with a card reader.

Advantageously, in the vending machine 1 it is possible to provide two magnetic card readers to allow simultaneous use thereof on the part of two customers, one programming the checkout of a medium and the other one returning another medium, even of a different format.

The device according to the invention is susceptible to numerous modifications and variations, all of which are within the scope of the inventive concept expressed by the accompanying claims. All the details may be replaced with technical equivalents which are understood to be protected by the following invention. The materials, the shapes and the dimensions may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Automatic device for distributing products externally shaped substantially like a parallelepiped, in particular audiovisual and digital media, comprising a magazine (M) which cannot be accessed from outside and is adapted to contain media (S), at least one handling unit (T) for loading and externally unloading said media through a slot (6), a means (32, 35) for reading an identification tag (34) associated with each medium (S), a means (4, 5) for the selection of a medium on the part of a user, and a means (7) for automatic payment for the preselected medium, characterized in that said magazine (M) is suitable to contain audiovisual and digital media (S_1, S_2, S_3) of various formats and dimensions, said handling unit (T) being suitable to handle said media independently of their formats and types.

2. Automatic device according to claim 1, characterized in that it comprises a box-like external container (2) which internally forms separate sections (M_1, M_2, M_3), each of which is meant to accommodate corresponding media (S_1, S_2, S_3) of different formats and dimensions.

3. Automatic device according to claim 2, characterized in that said separate magazine sections comprise cells (V) which have identical formats and dimensions.

4. Automatic device according to claim 1, characterized in that said handling unit (T) comprises a carriage (8) which can move along a first vertical guiding means (10, 11) which is anchored to said container and slidingly supports a slider (15, 16) which can move along a second horizontal guiding means (14) rigidly coupled to said carriage and is provided with a clamp means (20, 21, 22, 23) for handling said media (S).

5. Automatic device according to claim 4, characterized in that said clamp means comprises a clamp body (23) which can slide along a third horizontal guiding means (24) which is rigidly coupled to said slider (15, 16) and is at right angles to said second guiding means.

6. Automatic device according to claim 5, characterized in that said clamp body (23) supports a pair of elastic jaws (21, 22) which can move along a fourth horizontal guiding means (27) which is at right angles to said third guiding means, said jaws being provided with longitudinal profiled grip members (20) meant to interact with the sides of the medium (S) to be handled.

7. Automatic device according to claim 6, characterized in that it has a means (28, 29) for automatically varying the mutual distance of said jaws (20, 21, 22) along said fourth guiding means, in order to adapt said distance to the format and dimensions of the medium to be handled.

8. Automatic device according to claim 7, characterized in that said profiled grip members (20) have, toward their longitudinal ends, optical sensors (30) for detecting the relative position of the medium with respect to the jaws.

9. Automatic device according to claim 1, characterized in that it has a loading/unloading means which consists of a moving conveyance surface (33) which is arranged just inside said slot (6) for loading/unloading the media.

10. Automatic device according to claim 9, characterized in that said medium recognition means comprises at least one first linear bar code reader (3) which is arranged proximate to the media loading/unloading slot (6) in a lateral position with respect to the conveyor belt (33).

11. Automatic device according to claim 10, characterized in that it has a second radial bar code reader (35) arranged proximate to the media loading/unloading slot (6) in a central upper position with respect to the conveyor belt (33).

12. Automatic device according to claim 11, characterized in that said radial bar code reader (35) is supported so that it can rotate about an axis which is substantially at right angles to the medium transfer surface, proximate to the central axis of said surface with said medium in entry/exit position, to allow the reading of an annular data plate (34) which contains radial bar codes centered on said axis of the medium.

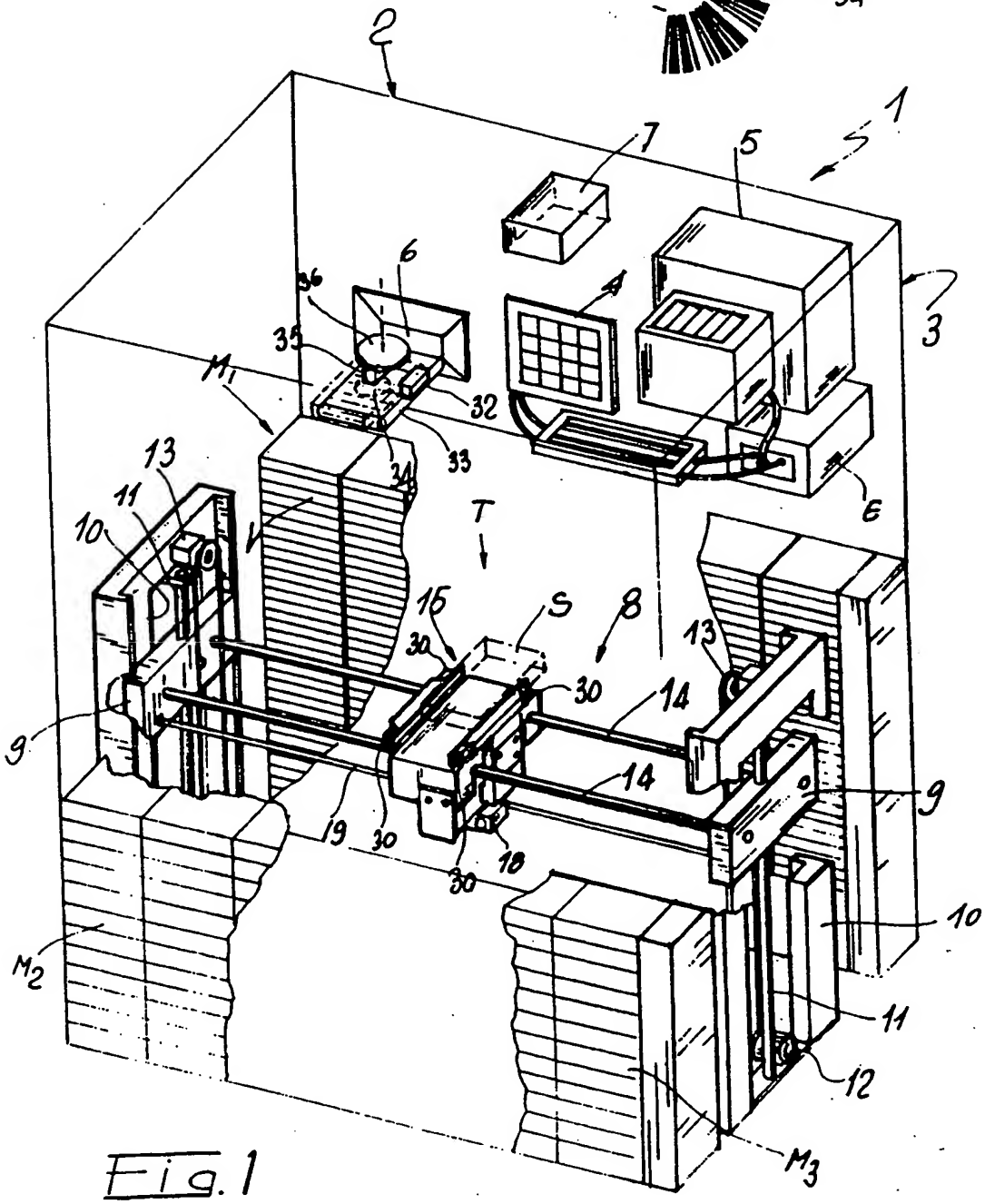
13. Automatic device according to the preceding claims, characterized in that it has a means for identifying a user by means of magnetic cards and the like, two devices for recognizing said cards being provided in order to allow simultaneous use of the vending machine by two different users.

14. Tag for identifying an audiovisual and digital medium which has cylindrical symmetry and is substantially flat with a relatively low thickness, enclosed in a container the external shape of which is substantially that of a parallelepiped, usable in combination with a vending machine according to the preceding claims, characterized in that it has a data plate (34) with a plurality of radial bars which are centered on the axis of the medium which is at right angles to its main faces.

15. Identification tag according to claim 14, characterized in that the data plate for the radial bars is annular (34) and has a minimum radial width equal to the maximum error in positioning the medium on the loading/unloading means (33).

Fig. 8


34


2
1
7
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S
6
36
4
3
35
M1
32
33
34
E
13
11
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V
T
15
S
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M2
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M3

Fig. 1

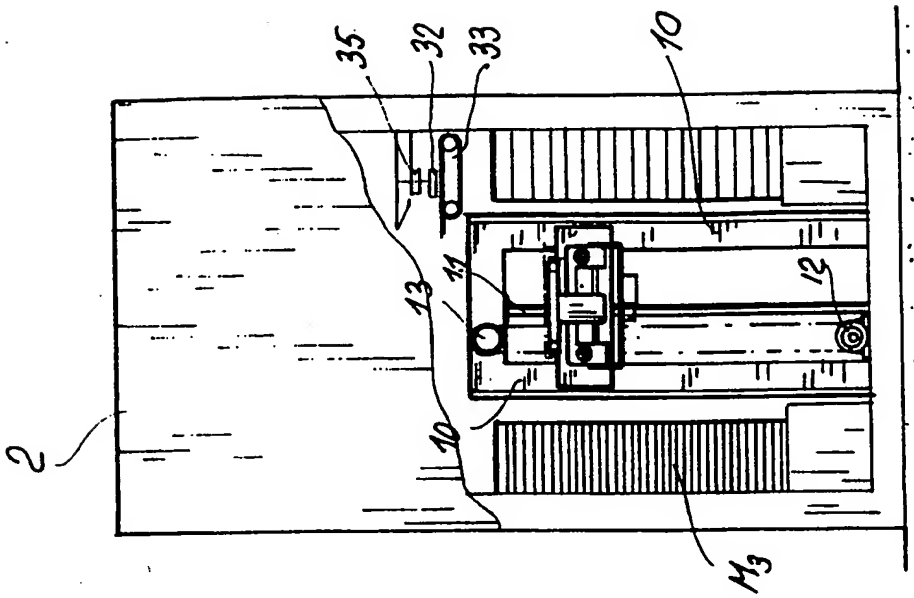

Fig. 3

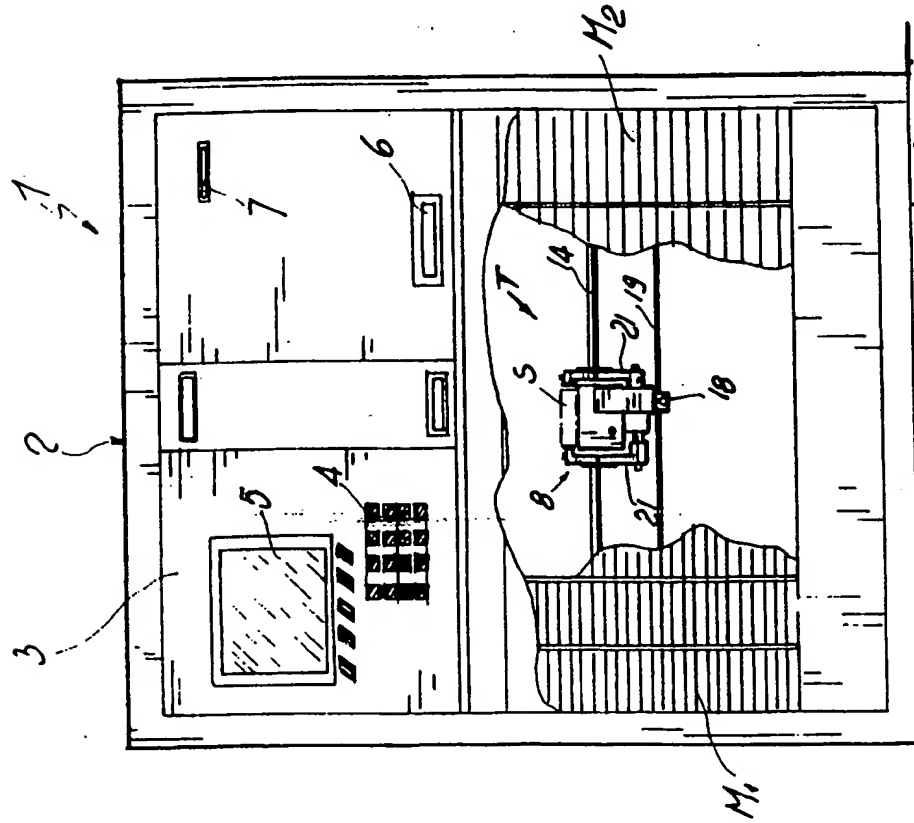

Fig. 2

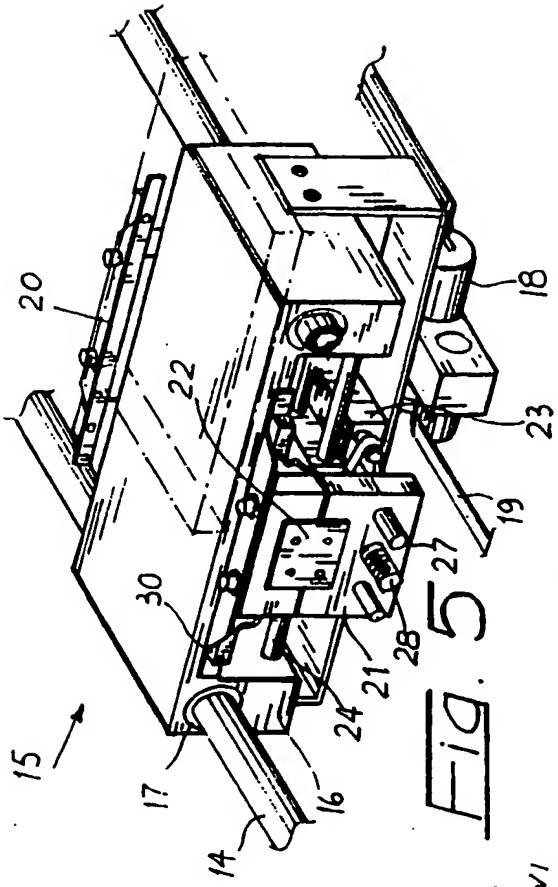

Fig. 5

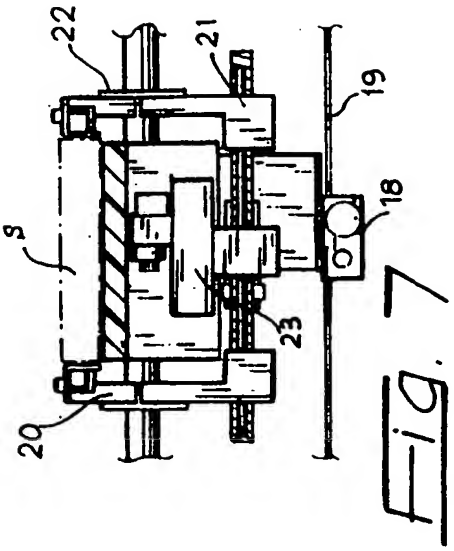

Fig. 7

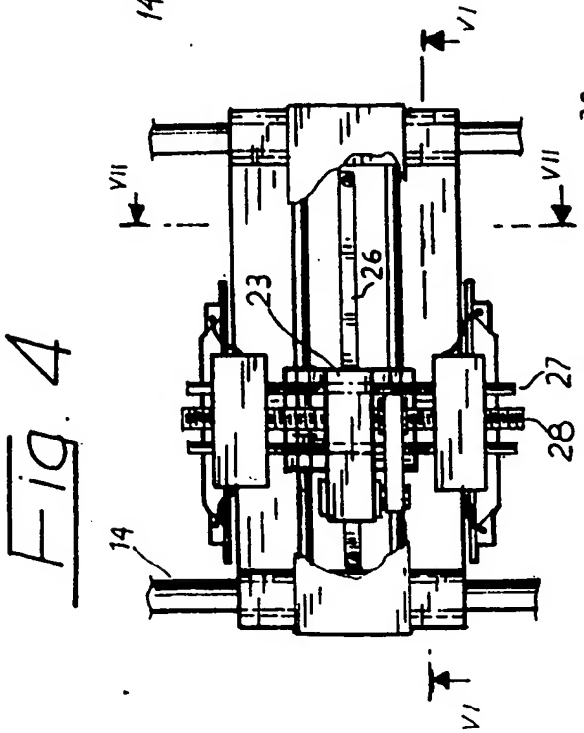

Fig. 4

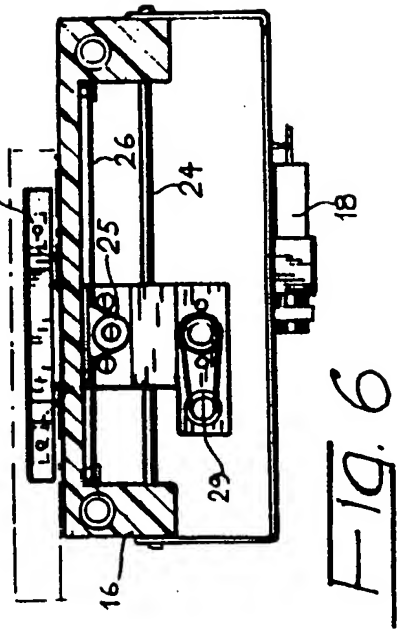

Fig. 6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 11 0506

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	WO-A-86 02758 (K.D. NYEGAARD) * abstract; claims; figures * * page 16, line 21 - page 21, line 8 *	1-5	G07F11/62 G07F7/00
A		6-8,10, 13	
Y	DE-A-33 14 189 (H-J. SCHLEICHER) * abstract; claims 1-4,9-23; figures 1,2,16-18 *	1-5	
A	WO-A-88 06771 (D. SHAH) * abstract; claims; figures 1-12 *	1-3,10, 13	
A	WO-A-86 05292 (TERM-TRONICS)		
A	EP-A-0 391 059 (IBM)		
A	DE-A-33 15 724 (W. RIENECKER)		

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

G07F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 October 1993	DAVID, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

& : member of the same patent family, corresponding document

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